

**545OneDrive2\_00014761**

EPAct budget discussion  
3/2/09

## EPAct Program Update for Chet France

Status and Budget

March 2, 2009

1

### **Status of Testing and Fuel Blending**

- Phase 1 testing complete
  - 75°F testing of 19 vehicles on 3 fuels (E0, E10, E15)
- Interim FTP-cycle testing complete
  - 75°F testing of 6 vehicles on 3 fuels (E0, E10, E15)
- Phase 2 testing complete
  - 50°F testing of 19 vehicles on 3 fuels (E0, E10, E15)
- Phase 3 testing expected to begin next week
  - 75°F testing of 10? (originally 19) vehicles on 27 fuels (E0, E10, E15, E20)
- Test fuel development being done by Haltermann and ASD
  - EPA defines fuel recipes
  - Haltermann prepares hand blends, bulk blends and performs fuel analyses
- 22 of the 28 fuels needed in Phase 3 have been blended in bulk
  - 13 have been delivered to SWRI

2

### Budget Considerations Going Forward

	Program or Project	Cost	Cumulative Cost	Difference of Total From the Original Estimate of \$4,200,000	
ORIGINAL PROGRAM	Original EPA Act Program Budget	\$ 4,200,000	-	-	-
	EPA Act Program, February 2009 Cost Estimate	\$ 5,728,700	Ex. 4 - CBI		
	Fuel Cost Adjustment				
ADDITIONAL PROJECTS	FTP Testing (Partially Completed)	Ex. 4 - CBI			
	EFM Resolution (Completed)				
	Miscellaneous				
	Blending of Two CRC Fuels				
	Emission Testing of Two CRC Fuels				
Grand Total >>>>		\$ 6,479,200	\$ 2,279,200	54.3%	

3

### Budget Considerations Going Forward (Cont'd)

- Original program cost estimate: \$4,200,000
- Cost overrun wrt the original scope of program: Ex. 4 - CBI
- Cost overrun including additional projects: Ex. 4 - CBI
- Funds spent or incurred as of Feb. 19, 2009: Ex. 4 - CBI
- Funds "remaining" in LD EPA Act budget as of Feb. 19, 2009: Ex. 4 - CBI
- Estimated cost of Phase 3: Ex. 4 - CBI
- Estimated cost of testing 2 CRC fuels in Phase 3: \$195,000
- New funds needed to get us through the end of fiscal year: Ex. 4 - CBI

4

### Causes of Cost Overrun

- Unrealistically low original cost estimates by SWRI
  - Underestimation of base program cost: **Ex. 4 - CBI**
    - On January 7, 2009, SWRI was estimating base program cost overrun by 10% vs. 36.4 % on Feb. 5, 2009
    - Unexpectedly high cost of "coming up to speed": **Ex. 4 - CBI**
    - Additional checkout tests to resolve HC analyzer saturation and secondary dilution ratio issues in Phase 2: **Ex. 4 - CBI**
    - Higher than originally estimated test replication rate (+6%): **Ex. 4 - CBI**
- Fuel cost increase (modified fuel development protocol): **Ex. 4 - CBI**
- Blending of two CRC fuels: \$55,000
- Additional tasks:
  - EFM resolution: **Ex. 4 - CBI**
  - Fuel matrix redesign: **Ex. 4 - CBI**
  - FTP testing: **Ex. 4 - CBI**

Program execution problems:

- Inadequate temperature control in Phase 2 of the program
- Fuels blended for Phases 1 and 2 contained undesirable components

5

### Options to Reduce Cost

- Delay testing of CRC fuels: \$195,000
- Reduce the number of test fuels
  - Reduction of the number of fuels by 1 would drop the G-efficiency of emission models below the minimum acceptable limit of 50%
    - Coverage drops, fuel effects become confounded
  - The emphasis of this program is on fuels, not vehicles
- Reduce the number test vehicles
  - Reduction of the number of vehicles from 19 to 15 doubles the probability of getting a non-significant result in emission models. The power of the statistical test of 0.80 is the lowest acceptable in std practice (0.95 was used in AutoOil)
    - We are working with DOE on vehicle selection
  - Reducing the number of test replicates from 2 to 1 has an even stronger impact
- Eliminate continuous THC, NOx.... measurements in raw exhaust
  - Would make critical types of information unavailable
  - Minimal savings
- Reduce the scope of exhaust HC speciation: **Ex. 4 - CBI**
  - The cost of HC and alcohol/carbonyl speciation:
  - Data necessary for AQ modeling and toxic emission factors
    - Phase I and II data not adequate due to fuel blending problems

6

### **Options to Reduce Cost (Cont'd)**

- Work with SWRI to reduce program cost
- Request additional DOE support

7

Back-up Slides

8

### Revised EPA Act Fuel Matrix

**Phase 3**  
Base Program (EPA)  
(Fuels 1-16) →

**Phases 1 and 2**  
RFS 2 Subset (EPA/DOE)  
(Fuels 17-19) →

**Phase 3**  
Additional Fuels (DOE)  
(Fuels 20-29) →

**E85 (DOE)** →  
**CRC Additional Fuels** →

Fuel #	T50	T90	ETOH	RVP	ARO
	°F	°F	%	psi	%
1	150	300	10	10	15
2	240	340	0	10	15
3	220	300	10	7	15
4	220	340	10	10	15
5	240	300	0	7	40
6	190	340	10	7	15
7	190	300	0	7	15
8	220	300	0	10	15
9	190	340	0	10	40
10	220	340	10	7	40
11	190	300	10	10	40
12	150	340	10	10	40
13	220	340	0	7	40
14	190	340	0	7	15
15	190	300	0	10	40
16	220	300	10	7	40
17	215	325	0	9	30
18	202	325	10	9	25
19	195	325	15	9	23
20	160	300	20	7	15
21	160	300	20	7	40
22	160	300	20	10	15
23	160	340	20	7	15
24	160	340	20	10	15
25	160	340	20	10	40
26	150	340	15	10	40
27	190	340	15	7	15
28	190	300	15	7	40
29	TBD	TBD	85	TBD	TBD
30	150	325	10	10	40
31	160	325	20	10	15

← Revised Fuels

9

### Light Duty Exhaust Program Summary

- EPA/DOE collaboration
- Objective: Establish effects of RVP, T50, T90, aromatic content and ETOH on exhaust emissions from Tier 2 vehicles
- Fuel matrix includes 29 fuels + 2 added by CRC = total of 31
- Test Program Design
  - Phase 1: RFS 2 Pilot at 75°F
    - 3 fuels (E0, E10 and E15) tested in 19 vehicles
    - Test results to be available for RFS 2 NPRM
  - Phase 2: RFS 2 Pilot at 50°F
    - Same as Phase 1, except temperature
  - Phase 3: Main Program
    - 27 fuels tested in 19 Tier 2 vehicles, E85 tested in 4 FFVs
- LA92 test cycle used throughout the program
- Species measured: Regulated emissions, CO<sub>2</sub>, NO<sub>2</sub>, VOCs, ethanol, carbonyl compounds
  - N<sub>2</sub>O, NH<sub>3</sub> and HCN by FTIR
  - Some PM and SVOC speciation

10

### Measured Species

- Bag (phase) level and composite emissions of THC, NMHC, NMOG, CO, CO<sub>2</sub>, NOx, NO<sub>2</sub>, ethanol and PM
- Bag (phase) level speciated volatile organic compounds (VOCs)
  - Over 200 compounds, incl. alcohols and carbonyls
- Continuous and integrated by bag (phase) emissions of the following species in raw exhaust:
  - THC, NMHC, CO, CO<sub>2</sub>, NOx
  - N<sub>2</sub>O, NH<sub>3</sub> and HCN by FTIR for a subset of tests
- Semi-volatile and high molecular weight VOC and PM measured in Phases 1 and 2 only

11

### Projected Schedule Going Forward

- Launch of Phase 3 testing: Mid-February 2009
- Completion of Phase 3 testing: Early December 2009
- Reporting: December 2009 – mid-March 2010

		JAN 2009	FEB 2009	MAR 2009	APR 2009	MAY 2009	JUN 2009	JUL 2009	AUG 2009	SEP 2009	OCT 2009	NOV 2009	DEC 2009
Phase 1*	14 weeks	5 12 19 26	2 9 16 23	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28
SOF setup	3 weeks	4 5 6 7 8 9											
Phase 2*	9 weeks												
SOF teardown	2 weeks												
Phase 3*	26 weeks			1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26									
NREL fuels*	17 weeks												
CRC fuels	4 weeks												
NREL high emitter	2 weeks												
draft final report	6 weeks												1 2 3
EPANREL review	4 weeks												
final report	4 weeks												

  

		JAN 2010	FEB 2010	MAR 2010	APR 2010	MAY 2010	JUN 2010	JUL 2010	AUG 2010	SEP 2010	OCT 2010	NOV 2010	DEC 2010
Phase 1*	14 weeks	9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28		
SOF setup	3 weeks												
Phase 2*	9 weeks												
SOF teardown	2 weeks												
Phase 3*	26 weeks												
NREL fuels*	17 weeks												
CRC fuels	4 weeks												
NREL high emitter	2 weeks												
draft final report	6 weeks	4 5 6											
EPANREL review	4 weeks		1 2 3 4										
final report	4 weeks			1 2 3 4									

12

# Ex. 4 - CBI



# Ex. 4 - CBI

**EPAct Cost Estimates (Assumes \$450,000 available from EPA)**

Feb. 2, 2009

Item
Estimated cost of Phase 3 - <b>UPPER LIMIT</b>
Estimated cost of Phase 3 - <b>LOWER LIMIT</b>
Funds currently available from the EPA
Additional funds from EPA
Funds "released" by DOE due to reduced scope of Phase 3 (15 veh., -50% HC spec'n)
Additional funds from DOE
Scaling back of the number of vehicles to 15
Scaling back of exhaust HC speciation by 50%
Elimination of continuous THC, NOx..... measurements in raw exhaust

**Total**

Additional funding needed to test 15 vehicles while scaling back HC speciation by 50%

**EPAct Cost Estimates (Assumes \$950,000 available from EPA)**

Item
Estimated cost of Phase 3 - <b>UPPER LIMIT</b>
Estimated cost of Phase 3 - <b>LOWER LIMIT</b>
Funds currently available from the EPA
<b>Additional funds from EPA</b>
Funds "released" by DOE due to reduced scope of Phase 3 (15 veh., -50% HC spec'n)
Additional funds from DOE
Scaling back of the number of vehicles to 15
Scaling back of exhaust HC speciation by 50%
Elimination of continuous THC, NOx..... measurements in raw exhaust

**Total**

Additional funding needed to test 15 vehicles while scaling back HC speciation by 50%

**Ex. 4 - CBI**

